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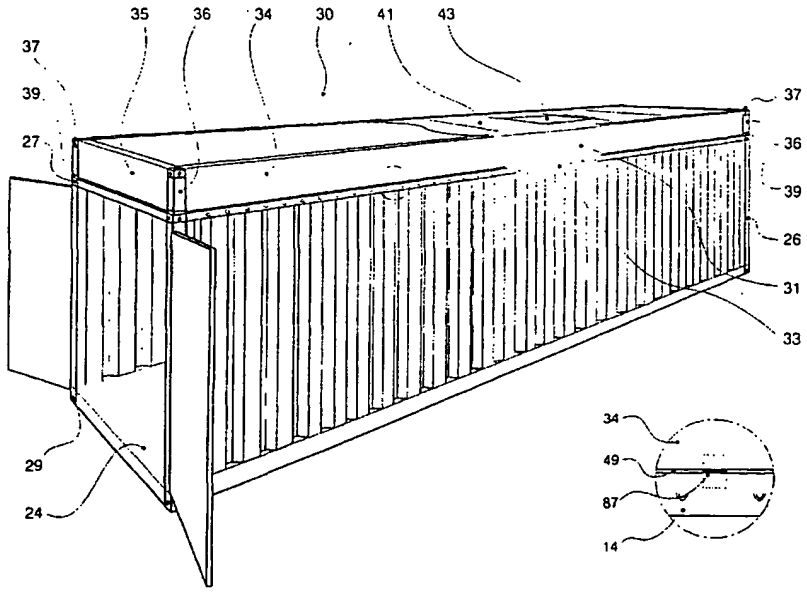

(57) Abstract: A container extension module (30) with standard footprint and end fittings (37, 39) upon corner stub posts (36), for coupling from below or above, to integrate with an underlying open top container (10) and so create a unitary extended container. A roof canopy (40) fitted to the extension module allows a more secure and weatherproof format. Modules can be stacked and intercoupled, for compact transport and storage. Modules can accommodate supplementary facilities, such as a collapsible vehicle load support frame (61).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Container Extension Module

Open Top

In the field of containerised freight transport and storage, a category of so-called 'open top' cargo containers is in widespread established use.

Configuration

Open tops are generally configured as a hollow rectangular box or shell, without permanent top.

In principle, a top or roof may be omitted altogether, but more practically, a (re)movable (temporary) roof may be adopted.

Peripheral upstanding longitudinal side and transverse end walls, between corner posts, surmount a base platform or deck - leaving an open top for (un)loading access.

An end wall may be (re-)movable, such as with an opposed door pair, hinged from respective corner posts and latchable to one another and the base in the closed position.

Loading entirely from above is feasible, or combined end and overhead loading through a (re-)movable end wall.

Thus, a load underslung from an overhead crane is drawn through open doors at one end, and lowered upon the platform floor, whereupon the end doors can be closed, if necessary leaving the load protruding somewhat above the side and end walls.

Construction

A typical construction is of sheet steel (side and end) wall panels, corrugated for stiffness, and braced at their peripheral edges by a steel frame - but again without a

permanent, solid, roof infill.

Cargo Fit

A typical cargo might be a heavy machine tool, or transformer, weighing, say, some 20 tonnes or so - that could not easily be carried within an enclosed box type container, with fixed roof, even using, say, a small fork lift truck.

Fabric Roof

Rather than a rigid, solid panel structure, a removable roof is more conveniently of (weatherproof) fabric, such as a (filament reinforced plastics sheet) tarpaulin.

Roof fabric can be gathered in, say, mutually overlapping concertina folds, in an open condition.

In a closed condition, roof fabric is supportable upon removable roof bows, fitted, say through detachable clips, to the open top frame periphery.

The fabric is stretched taut over the supports and tensioned by edge ties, to the upper framework.

Logistical & Economic Rationale

As an established mode of freight shipping, containers can travel worldwide.

Desirably, to avoid an uneconomic return-empty container mode, an outbound load is substituted with a return or inbound load.

Thus, say, a cargo, such as a machine tool, might be shipped from Germany to Japan.

Once unloaded, another suitable cargo is sought to fill the container - and to justify the expense of shipping the container back to the point of origin in Germany.

However, for 'open tops', it is regularly found difficult to find as many return, as outward, cargos.

Thus, for example, in Japan typical (export) cargos are electronic goods or textiles - where shippers demand containers with complete water tightness.

Unfortunately, the fabric roof of an open top is not completely watertight - and a conventional open top is incompatible with vulnerable cargos.

Thus open tops are often in the wrong location and have to be relocated empty - at substantial cost - even to another country, to find suitable cargo.

Dimensions & Dimensional Obsolescence

Historically, an overall containerisation standard is some 20ft or 40ft length and 8ft 6in height.

However, container heights are growing, as shippers seek to accommodate ever more cargo - to optimise geometric limits still meeting transport regulations.

The older common height standard of 8ft 6in is being superceded by 9ft 6in, or more.

Thus existing (older) standard open tops are becoming (dimensionally) obsolete.

Some aspects of the present invention address that issue.

Fabric Roof Vulnerability to Theft

Theft or pilferage from, and smuggling inside containers, is another problem.

In an open top, a fabric roof is easily cut or prised open, to gain access to container contents.

Thus, a roof alternative, reinforcement or supplement could be advantageous.

Prior Art

Rigid Roofs & Extension Walls

Open tops with (re)movable steel roof panels have been devised.

However, these do not increase the space available inside the open top - nor can they be stacked, for carriage and storage in transport modules.

Similarly, rigid extension walls have been employed, but again these do not allow container stacking.

Scaling

Similarly, reduced scale - and in particular stacking depth - containers have been proposed.

Thus, US 4,360,115 (Saunders) adopts a modular approach for overall space utilisation efficiency in addressing different load densities.

Saunders envisages combining container modules to create a large unit, compatible with a full size container volume.

Stacking a shallow container module upon an open top shallow container module is shown.

This does not however create a deeper open top - merely discrete stacked modules.

Thus, each module is effectively a fully featured container.

Statement of Invention

According to one aspect of the invention,
a (container) extension module (30),
is (de)mountable upon a container (10),
to extend overall height or depth.

In a particular construction,
a container extension module,
is configured for an open-top container,
and comprises:
a shallow peripheral frame,
with open opposed top and bottom faces,
and a plurality of upright stub corner posts,
fitted with selectively releasable end couplings.

Corner Stub (Posts)

End fittings for corner stub posts allow installation of couplings (such as TWISTLOCKS) - operable for selective interlock, (from above or below), either with containers, or other extension modules, conforming to a common standard.

A top end fitting could be configured as a corner box, whereas a bottom end fitting could simply be a plate with an aperture to receive a coupling element.

Extension Rim Module

In practice, the extension module is envisaged as a shallow marginal upstanding peripheral edge rim.

Supplementary Load Height

As such, the module would not impact upon the internal dimensions, that is in width and span, but would supplement internal height, at least inboard of the container

frame.

Thus, in a conventional container, (un)loaded through a peripheral frame, there may already be a marginal 'deadspace' equivalent to a (top) frame rail depth,unoccupied by load.

Integrated Unitary Structure

The mutual interfit and (albeit localised) locking interaction effectively integrate the extension with the underlying container - as a unitary structure.

Base Module

Although the extension is primarily envisaged as an overhead or top element, in principle, the extension could be fitted as an underneath or base module.

A base module would make sense if, say, a dimensional (ie height) uplift, self-contained additional load space, or supplementary facilities, were required.

Top Module

As with the base module, an extension is also envisaged for fitting on to a general purpose container with fixed roof (ie not merely an open-top) to provide a module, possibly sealed water tight and incorporating additional equipment, such as generators, heating, fuel etc, say, for use with the underlying container.

Stacked Interlocked Extension Modules

It also follows that, multiple, mutually interlocked extension modules, of complementary form, could be stacked, one upon another, to create an overall deeper peripheral cargo embrace or restraint ring.

In that case, the stacked extension modules could be fitted to a flat rack platform base.

This would not necessarily be an alternative to a bespoke unitary open-top - but rather an option for what might otherwise be a passive return empty mode for extension modules - and indeed a flat rack.

Frame Rail Interaction

Aside from corner (post) locking interfit, for mutual stacking support, provision may be made for (space) frame rail interaction .

Thus, for example, opposite longitudinal upper side rails of an open top container may be 'keyed' to the complementary corresponding side rails of an (open top and bottom) extension module.

This helps compensate for the omission, or at least relocation, of transverse roof bracing rails.

It is envisaged that a central and two opposed intermediate key interaction points would suffice.

Peripheral Lip/Flange Seal

An alternative would be a continuous peripheral flange or lip, which could also help mutual sealing, for weather resistance.

Compatibility of the extension frame module with other containers, is an important consideration and distinction from hitherto known extensions.

Moreover, an extension module could help the container assume another role - such as a (semi) permanent enclosure, for purposes other than cargo storage and transport.

The extension frame could incorporate one or more permanent or demountable solid roof panels.

Alternatively, reliance could be place upon a fabric cover, such as an that used for an open top container upon which the extension frame is installed, with a peripheral extension skirt.

A roof canopy module could be separate from, or integral with, a (top) extension module.

Roofed Extension

A roofed extension module provides a means, selectively, to increase the height of an existing open top, by fitting a subsidiary top frame, to make it more weather-tight and theft proof.

As such, the extension may be temporary or (semi) permanent.

Module Removal & Stacking

It is envisaged that such extension frame modules could be removed and stacked together - ie one upon another - for economical transport and storage.

Thus an open top could revert to its original format.

Sealing & Weather Resistance

Provision could be made for imparting weather resistance, if not proofing.

Such sealing could be achieved by a depending peripheral edge flange, plate or lip, interposed or interfitting between the extension module and the open top container to be extended thereby.

An intervening resiliently deformable sealing element, such as a rubber gasket, could be fitted.

Seal Protection

The seal could be protected when not interacting directly with a container frame, such as when resting upon the ground, or stacked with other extensions.

It envisaged that this could be achieved by appropriate configuration of side geometry.

Thus a complementary interfitting profile of module frame and container top frame could be contrived.

A peripheral edge seal could be confined within a marginal depending edge rim or ledge, which would itself make mechanical contact with a ground or other support surface.

Alternatively, retractable or (re-)movable extension block or strut elements - say at the corners - could be employed, to keep the seal clear of unwanted surface contact when extended.

Additional Cargo

When installed, the extension module provides additional cargo capacity.

This allows use of what might otherwise be a dead-space at the container roof.

Thus, awkward or elongate shape cargo - which might otherwise protrude - could be accommodated.

Extension Facilities

More pro-actively, the extension module could accommodate additional facilities, better to adapt the container to a prospective cargo, or for alternative usage than merely cargo transport and storage.

Such so-called 'top-up' facilities, designated by the Applicants as 'Over-The-Top' or 'OTT' (Trade Mark), could include, say:

- fold down (insulated) wall liners, or curtains, and floor;
- environmental conditioning, eg space heaters, coolers, (de-)humidifiers, ventilators or air conditioning, for the cargo area;
- auxiliary power units (APU's), eg electrical generators, batteries, pressurised water or air supplies;
- extendible crane jib for cargo lift, without reliance upon external cranes or fork lifts;
- bulk hatches with re-usable liners;
- integral strength once module is connected to open top container, for handling, stacking, lifting as a unitary container entity;
- supplementary decks or frames for non-stacking cargo, allowing disparate cargo mix-and-match;
- load support (eg suspension) frames;

Vehicle Containerisation

As a particular version of a generalised load support proposition, the extension module could accommodate collapsible vehicle support frame elements, such as vehicle ramps and supports, and attendant drive mechanisms, for a containerised vehicle cargo.

EP 0808780 (Oglio) teaches vertically movable lifting frames for stacking a motor vehicle load, one vehicle upon or overlying another with a container volume.

However, this represents a complex, cumbersome and inflexible approach, ill-suited to conversion of conventional containers and one intended as a permanent installation.

Containerised vehicle stacking is explored in my companion UK Patent Application 0103634.2 of 14 February 2001.

Embodiments

There now follows a description of some particular embodiments of the invention, by way of example only, with reference to the accompanying diagrammatic and schematic drawings, in which:

Figure 1 shows a perspective, view of a generally known open top container, with fabric roof part cut-away to reveal transverse roof support bars, and (re-) movable, co-operatively disposed end doors open;

Figure 2 shows a perspective view of an overhead, top or roof extension module according to the invention, installed upon an otherwise conventional open top container of Figure 1 - to create an overall container of supplementary cargo depth capacity;

Figure 3 shows a detail end elevation of an upper portion of the open top container installed top extension module combination of Figure 2, with provision for peripheral edge sealing and fabric roof tie down(s) relocated to the extension and underlying container side frames;

Figure 4 shows multiple individual extension modules, such as deployed in Figures 2 and 3, stacked one upon another, for return-empty storage and transit role or mode, but leaving respective (fabric) roof canopies *in situ*;

Figure 5A shows a part cut-away top section detail of a seal between an extension roof overhang and an extension side frame;

Figure 5B shows a sectional and part cut-away view of stacked extension modules, with respective roofs having peripheral edge overhangs installed, and with extendible corner stub posts, to obviate unwanted roof seal-to-ground contact;

Figure 5C shows a split edge seal configuration of complementary interfitting (male and female) profile between extension module and container frames;

Figure 6 shows a side elevation of a container extension variant adapted for vehicle (un) loading and support, through retractable loading ramps and vehicle support frames, for containment within the module when not deployed;

Figure 7 shows an enlarged sectional detail of a corner support stub leg for a container extension module;

Figures 8A through 8C show various extension module and container collapsed stacking mode configurations;

Thus, more specifically:

Figure 8A shows multiple extension modules stacked upon a common container - depicted as a solid wall open top variant (10) on one side and an open (curtain sided) variant (70) at the other side;

Figure 8B shows multiple extension modules stacked upon a collapsed platform deck with folding end walls, or flatrack, container;

Figure 8C shows multiple stacked extension modules, with respective on board facilities (59);

Figure 9A shows a perspective view of an extension module mounted upon an erected flatrack, to bridge upstanding)end walls; and incorporating a panel (56) movable between extension roof space and a side wall position between flatrack end walls (58);

Figure 9B shows a part-sectional side elevation of the movable panel (re-)disposition of Figure 9A;

Figures 10A and 10B are split views of opposite sides of an extension module surmounting a container; detailing corner post and end fitting disposition and stacking, along with roof canopy edge skirt and sealing, with an underlying container;

Figures 10A and 10B thus correspond generally to Figure 3, with more constructional detail; the same references being used for corresponding parts;

Thus, more specifically:

Figure 10A is a fragmentary, part cut-away detail, taken between corner stub posts, of an extension module roof side wall skirt to container top frame rail relative disposition and mutual seal, or interface;

Figure 10B shows extension module, corner stub post end fittings; a top end fitting being configured as a corner block, whereas a bottom fitting is a simple plate with an aperture, to receive a proprietary discrete coupling element, such as a TWISTLOCK;

Figures 11A and 11B are corresponding split-sided views to Figures 10A and 10B respectively, for an individual extension module, with roof canopy; Figure 11A showing a corrugated roof panel;

Figures 12A and 12B are corresponding split-sided views to Figures 11A and 11B showing stacked extension modules and optional corner post end extension by a depending coupling leg;

Figures 12A and 12B similarly correspond generally to Figure 4, albeit with more constructional detail, and so again the same references are used for corresponding parts;

Figure 13 is an upper plan view of an extension module with corrugated roof canopy

panel, as shown in Figure 11A;

Referring to the drawings, a conventional known open top container 10, depicted in Figure 1, has a hollow generally rectangular box or shell form.

Peripheral upstanding longitudinal side walls 17 and transverse end walls 18 are disposed between upright corner posts 16, and surmount peripheral edges of a base platform or deck 24.

Side walls 17 and end walls 18 are of corrugated metal (eg steel) sheet, braced by peripheral frame rails 14, 15, 19 and corner posts 26.

At one (nominally, rear) end are paired hinged doors 11, forming a (re-)movable end wall.

The end doors 11 are surmounted by a (re)movable door header beam 13.

Header 13 has an end pivot to top side rail 14, and so can swing between an open position as shown, and a closed position, as a top end rail, depicted by broken line 13'.

Header 13 and doors 11 are shown open, for container 10 end access.

This enables combined overhead and end (un)loading.

At the opposite (nominally, front) end to header 13 is a fitted a top (transverse) end rail 15, surmounting end wall 18, detailed in Figure 3.

Longitudinal side walls 17, are surmounted by respective top rails 14, and corresponding opposed bottom rails 19.

Within the container 10, and bounded by the bottom rails 19 is a base platform, floor or deck 24, typically of steel or plywood sheet.

A fabric roof 20, such as a tarpaulin, spans the container footprint and overlaps top side rails 14 by marginal strip flaps 21.

Fabric roof 20 is secured to the side and end walls 17, 18 and also top rails 14, 15 by fastenings 23, such as tie down loops.

Fabric roof 20 is supported, over its span of the container void, by a series of longitudinally-spaced transverse roof bars or bows 22, revealed where the canopy has been shown part cut-away.

Roof bows 22 are of cured profile and are clipped in position at each end between respective opposed top longitudinal side rails 14.

(Un)Loading Access

Both fabric roof 20 and roof bows 22 are demountable and removable for (un)loading, upon opening header 13 and end doors 11.

At the top and bottom ends of each corner post 16 are respective end fittings 27, 29, for container 10 handling and stacking.

End fittings 27, 29 are compatible with (discrete) installable releasable couplings, such as proprietary TWISTLOCKS.

A hollow rectangular box construction, typically of cast steel, with handling apertures 31 in (three) outward faces, is employed for top and bottom end fittings 27, 29. This is in contrast to the end fittings of the extension module, described later.

Extension Module

Figure 2 shows an open top container 10 fitted with an extension module 30 according to the invention.

In this example, extension module 30 is configured as an overlying (roof canopy) 40, but the general extension principle is applicable to a base.

Extension module 30 comprises a shallow depth, open faced, rectangular frame, of corresponding footprint to the container 10.

The extension module 30 frame comprises side and end walls 34, 35 between corner stub posts 36, with end fittings 37, 39.

Top end fitting 37 is shown as a complete rectangular corner box, with handling apertures, as with the container end fittings 27, 29, whereas bottom end fitting is simple flat plate with an aperture. This form could also be adopted for the top end fitting.

Conversely, a single aperture plate bottom end fitting 39 could be substituted by a complete rectangular box as container end fittings 27, 29.

If the extension module 30 depth allows, top and bottom bracing rails (not shown) may be fitted, with intervening extension side and end wall panels.

Juxtaposed extension and container frame rails may be marginally spaced and/or may inter-relate, or inter-engage, say with mutual location fittings 87.

That said, the prime interaction - and in particular coupling - between extension module 30 and container 10 is through respective corner post extension fittings, now described.

Thus, extension module 30 lower end (plate) fittings 39 engage corresponding upper corner (block) end fittings 27 of an underlying open top container 10.

End fittings 27, 39 are selectively secured together, through releasable internal couplings 91, such as TWISTLOCKS.

Once secured, the extension module 30 and container 10 form an integrated, unitary

entity, for top lifting, (un)loading, handling and stacking.

The extension module 30 and container 10 entity can be interfaced with other containers 10 or modules 30, using end fittings 37, 29.

Roof Canopy

Reliance can be placed upon a similar overlying fabric roof canopy infill 41, as for unextended open top container 10, albeit with somewhat deeper peripheral edge extensions 31, to embrace the additional depth to the fastenings 33, such as tie loops .

Alternatively, as in Figure 2, extension module 30 could be fitted with a solid roof (infill) panel 40 - shown part cut-away, to reveal container 10 interior.

As shown in Figure 3, the extension module 30 surmounts open top container 10 header 13, upper side rails 14 and end rails 15 - either directly, or with an intervening marginal clearance, and seal infill 32.

A solid roof panel 40 could be thin steel sheet - some 2mm thick - corrugated for stiffness and strength.

Figures 9A and 9B show a (re-)movable roof canopy panel 56, (re-)deployable as a side wall panel. Additional panels 56 could be provided to deploy as side walls, whilst a static roof 40 remains in place.

Load Capacity Depth Increase

The overall height or depth of the interior cargo load space, between the original floor 24 and the new roof canopy 40/41, is increased significantly, by the depth of the rails 34, 35 and corner stub posts 36.

If a lesser , even minimal (say, 6 inch, 4 inch or less) extension were required, the whole extension module could be compacted accordingly.

A solid (say, steel) panelled roof 40 affords a more overall robust container, against ingress of weather or thieves, albeit with a modest weight penalty.

Where unnecessary for the cargo to be weather resistant, waterproof, or 'theft-proof', the roof canopy 40 could be omitted altogether - exposing the container 10 interior and any cargo to the elements.

Sealing

Figure 3 shows a marginal gap 32 between extension module 30 end frame 35 and open top end rail 15 bridged by a shallow, elongate, resilient strip seal, such as a rubber gasket 32, fitted to either one or both elements.

As shown in Figure 5C, opposed seals or gaskets 57, 57' respectively roof canopy 50 or extension frames 34, 35 and container top side and end rails 14, 15 could be of complementary profile, for enhanced sealing efficacy.

Substantial such seals also help cushion what would otherwise be direct mechanical contact between extension and container - with possible shock loading of facilities in the extension.

As another seal variant in Figure 3 , a depending fabric skirt 42 could be fitted, by fasteners 38, such as (snap-action) rivets, to side frame 34 and/or end frame 35 - to hang over top side and end rails 13, 14, 15, with its lower edge secured thereto by fastenings, 23, 33, such as known tie loops, as fitted to typical open top containers 10.

Roof Extension

Although roof panel 40 is shown located just below the top face of the top corner end fittings 27, it could be dome shaped to a somewhat higher level, as shown by line 40'.

Level 40' is well above the corner stub post top end fittings 37 - thereby increasing

the depth of the cargo space inside open top container 10.

Corner End Fitting Height Adjustment

A deeper or taller roof canopy, to level 40' could be accommodated by installing auxiliary corner fittings 37', as shown in broken outline .

These extensions 37' could be stored, say in pockets or upon ledges (not shown), adjacent top frame 34, 35, or installed as discrete items.

Thus by stacking of one or more auxiliary corner end fittings 37' upon fixed corner end fittings 37, a mounting point beyond extension level 40' could be achieved.

An alternative, would be (say, telescopic) depth adjustable corner stub posts 36.

With extended corner fittings 37' for extension module 30, standardised overall handling and stacking conformability are restored for the container 10 and extension module 30 combination.

Roof Profile

Aside from increased load depth capacity, a deeper roof profile 40' could be shaped to complement particular loads and/or road/rail confinement gauges.

Thus, for rail carriage of tall containers, tunnels, overhead power supply gantries, bridges and other permanent way obstruction profiles, restrict, or are incompatible with, rectangular container forms.

However, somewhat greater roof height 40', locally inboard of container sides, could be accommodated.

Thus, a roof profile 40' higher than top corner fittings, could conform, were there some means to adjust or restore corner fitting height, for handling.

Ventilation

As depicted in Figure 3, an array of ventilation holes 28 might be provided, given that certain cargos require water-tightness, but extra ventilation.

These could work in conjunction with on-board facilities such as (ducted) fans.

Typical perishable cargos requiring such treatment are coffee beans, which sweat a large degree of moisture in transit from one country to another.

Roof Access

Reverting to Figure 2, once an extension module 30 is in situ, it may be required for granular cargo or liquids, or even personnel, to access the container.

To this end local (hinged) access hatches 43 might be built into a roof canopy 40.

Hatches 43 could be locked for load security - and opened when required.

Figures 4, 12A and 12B show part cut-away end views of two extension modules 30, with associated (shallow) roof canopies, stacked one upon another.

They are secured by proprietary couplings 91, such as TWISTLOCKS, installed between abutting upper (box) and lower (plate) end fittings 37, 39. Such couplings 51 might be loose proprietary items, or permanently integrated with lower fittings 39.

Multiple extension modules 30, with attendant on-board facilities 59, might be stacked, one upon another, and intercoupled, for integrated handling, as shown in Figure 8C and 10.

Moreover, as shown in Figure 8A, a lower extension module 30 in a stack could be mounted upon an underlying open top container 10.

This creates an even greater depth increase, or simply for generally stacking flexibility,

especially where intermediate modules 30 have respective roof canopies 40 omitted.

To ensure a seal between a modules 30 with and without a canopy 40, side end frames 34, 35 (of one module 30) could be shaped as top side rails 44, end rails and header 15, 14 to mate with the seals 32 of another module 30.

Figure 5A shows a vertical section through the top side rails 44 of open top container 10 and an alternative, minimal 'roof canopy 50 only' extension module 30 - minimising or omitting side frames.

The roof canopy 50 can thus mount directly upon the container 10, with a modest clearance and intervening seal.

The compact roof canopy 50 stacking configuration of Figure 5B doubles the packing density, compared with stacking extension modules 30 complete with side, end frames 34, 35 and corner posts 36.

More specifically, a domed roof canopy 50 has tapered sides 48 merging into a step 46, with a depending edge skirt 45, which bridges an intervening clearance or gap 49 between extension 30 and container 10.

A robust, protruding, resilient edge seal 45, such as a rubber gasket, is fitted between roof step 46 and top rail 44, as a mounting cushion and to inhibit water ingress and promote weather resistance.

A split, complementary interfitting, cushion seal variant 57, 57' is shown in Figure 5C.

Detachable & Stackable Roof Canopy

Roof canopies 50 could be disposed for compact mutual stacking, with their domed profiles closely internested, as shown in Figure 5B.

Similarly, roof canopies 50 could be detachably mounted upon respective side and end frames 34, 35

Thus stacked roofs 50 are depicted in section as a solid infill line, with respective frames 34, 35 and corner stub posts 36 omitted or shortened, but end fittings 39, 49 retained.

One or more discrete spacers, say configured as shortened stub posts or blocks 36, are fitted between successive stacked top corner fittings associated with each roof canopy 50, to preserve clearance therebetween.

If another roof canopy 50 is to be added to the stack, or if the stack is to be handled, one or more discrete supplementary corner fittings 55 are installed, until beyond the uppermost roof canopy 50 level.

An alternative to spacer blocks 44 would be shortened or retracted corner stub posts 36.

In Figure 5B bottom spacer blocks 52 are fitted beneath lower end fittings 39, to space its edge lip 47 from the ground 53.

This block 52 is formed as equivalent to a bottom corner fitting 29 to complete a stack of modules 40 for shipment as a single unit as seen in Figure 8C.

When block 52 is not fitted, couplings, such as TWISTLOCKS can configured to extend beyond lip 47, to engage the ground 53.

Vehicle Support Frame

Figure 6, shows a part-section side elevation of an open top container 10 surmounted by an extension module 60 according to the invention, fitted with a bespoke (retractable) vehicle load support.

Overall, several vehicles 71-74, such as cars, are disposed within an extended container confines, in a compact internesting stacking configuration.

Of these, two vehicles 72, 74 sit level directly upon a floor platform 67.

Another two vehicles 71, 73 sit upon respective inclined elevated vehicle support frames 62, 61.

The vehicle support frames 61, 62 are carried by extension module 60, through respective fore and aft suspension links 64, 68 and 65,69.

An operating mechanism, such as drive motors 78, 79 and 83, 84 (not detailed), allows retraction of suspension links 64, 68 and 65, 69.

Thus, say, links 68, 69 could be retractable suspension cables upon pulleys and links 64, 65 collapse foldable articulated elements.

Vehicle support frames 61, 62 could also be mounted upon side posts, with, say, internal screw jacking pillars.

The upper level vehicles 71, 73 are disposed with their respective bonnets 81, 82 projecting up into the headspace of extension module 30.

A retracted or stowed vehicle support frame 61, 62 position 85 restores much, if not all, of the internal load depth - facilitating access to deck platform 67.

Vehicle support frames 61, 62 can lie flat upon floor platform 67, be elevated intermediate floor 67 and roof 77, or disposed at a desired orientation, such as (rearward) inclination or tilt.

Vehicle Loading & Disposition

A vehicle 71-74 enters through open end (doors) 11 onto a frame 61/62 set level with deck 67.

Frame 61/62 is then raised with support elements 64/68, 65/69 towards extension module 30.

Frames 61, 62 are elevated and orientated, ie tilted, to a disposition which most effectively utilises interior volume capacity, whilst preserving even weight distribution between container 10 ends.

Vehicle Restraint

Vehicles could be secured by tie straps 63, passed over vehicle wheels 66 and tied to local vehicle support frame 61, 62 or container floor 67.

Access

Such tie straps 63 are operated manually - for which an operator must enter a tightly confined space between vehicles.

With container 10 fully loaded with internested vehicles 71-74 there is little space in between for operator entry to secure vehicles in position.

Rather than risk vehicle damage by squeezing past, an ladder 88 might be provided, from a roof access hatch 89.

Bracing

An additional bracing elements can be wedged or otherwise fitted between vehicle support frames 61,62 or even vehicles 71-74 themselves and the container 10.

Figure 7 is an example of such bracing, and shows a portion of corrugated container side wall panel 87.

Typically panel 87 comprises a corrugated steel sheet, some 2mm thick, and of trapezoidal corrugated profile.

A vehicle support frame 61 is marginally inset from panel 87, and is stabilised, both transversely and longitudinally, by a screw-adjustable spacer block 86 locating in a

corrugation recess.

A screw mechanism 76 is used to block 86 in and out of engagement with the side wall 87.

Flatrack Compatibility

Extension modules 30 might be used in conjunction with diverse containers, such as flat-racks and open (curtain) sided configurations.

For compactness of illustration, Figure 8A combines:

- a solid (corrugated) wall open top container variant at one side; and
- an open (curtain) sided variant at the other side;

surmounted by stacked extension modules 30.

A fabric roof canopy 41 might be made larger, to reach an erected flat rack base and protect cargo.

Alternatively, as shown in Figures 9A and 9B, a rigid panel 56 might be accommodated within an extension module 30 and (re-)deployable between (retracted) roof and (extended) side wall modes.

Deployment would allow protection of otherwise exposed flatrack cargo.

Extension module 30 could be mounted upon (or below) a collapsed flatrack, for relocation.

Vehicle support frames 61, 62 of Figure 6 example are housed within extension module 30, but might alternatively be discrete, for separate shipment.

Although illustrated as a single assembly, extension module 30 might comprise sub-assemblies.

Thus, say, side and end frames 34, 35 could be demountable upon discrete corner stub posts 36, with respective corner fittings 37, 39.

Corner stub posts 36 might be extendible, at either or both ends, ie upward and/or downward, to allow (extreme) roof canopy 40 elevation.

Facilities

Figure 8C shows an extension module 30 might house diverse facilities 59, such as container environmental conditioning and control plant.

Thus refrigeration plant could cool the container space; or heating plant provide space heating.

Similarly, lighting, ventilation fans, watering sprays and other such features could be installed.

Even extendible crane jibs could be accommodated for cargo (un)loading.

Component List

10	container
11	end doors
12	
13	header beam
13'	closed position of 13
14	top (longitudinal) side rail
15	top (transverse) end rail
16	

17	side wall
18	end wall
19	bottom rail
20	fabric roof
21	side skirt
22	roof bow
23	fastening
24	floor
25	aperture (corner fitting)
26	corner post
27	top corner fitting
28	ventilation hole
29	bottom corner fitting
30	extension module
31	side skirt
32	clearance / gap
33	fastening
34	(longitudinal) side frame
35	(transverse) end frame
36	corner stub posts
37	top end fitting
37'	37 extended position
38	fastening
39	bottom end fitting
40	roof canopy
40'	extended position of 40
41	fabric roof canopy
42	fabric skirt
43	hatch (roof)
44	top frame
45	edge seal

46 step surface
47 edge lip
48 tapered portion
49 clearance / gap

50 roof canopy
51 coupling foot (such as TWISTLOCK)
52 foot spacer block
53 ground
54 spacer block
55 discrete coupling block
56 (re-)deployable roof/wall panel
57/57' split seal
58 end wall
59 facilities

60 extension module
61 vehicle support frame
62 vehicle support frame
63 (vehicle) wheel tie / strap
64 suspension link
65 suspension link
66 (vehicle) wheel
67 floor
68 suspension link (cable)
69 suspension link (cable)

70 curtain sided container
71 vehicle (forward upper level)
72 vehicle (forward lower level)
73 vehicle (rearward upper level)
74 vehicle (rearward lower level)
75 roof
76 screw adjustment

77 corrugated side wall
78 drive motor
79 drive motor

80 flatrack
81 bonnet
82 bonnet
83 drive motor
84 drive motor
85 retracted position (frames 61, 62)
86 support block
87 inter-frame location
88 step ladder
89 hatch

91 coupling (such as TWISTLOCK)

Claims

1.

A (container) extension module (30),
[de]mountable upon a container (10),
to extend overall height or depth.

2.

An extension module, as claimed in Claim 1,
configured for open-top container,
and fitted with a roof canopy (40),
sharable by an underlying open-top container,
when the extension module is mounted thereupon.

3.

An extension module,
as claimed in either of the preceding claims,
with a (re-)movable roof canopy,
configured for selective deployment,
upon the extension,
and any underlying otherwise open-top container.

4.

An extension module,
as claimed in any of the preceding claims,

incorporating a fabric roof canopy,
extended to create a peripheral skirt,
around the top of an underlying containers.

5.

An extension module,
as claimed in any of the preceding claims,
incorporating a solid panelled, segmented or unitary, roof canopy.

6.

An extension module,
as claimed in any of the preceding claims,
comprising a rectangular frame (34, 35),
incorporating corner stub posts (36),
configured for end support.

7.

An extension module,
as claimed in any of the preceding claims,
comprising a rectangular frame,
incorporating corner stub posts,
with end fittings (37, 39),
for selective securement,
through couplings,
to another container,
or containerised handling and transport facility.

8.

An extension module,
as claimed in any of the preceding claims,
comprising a rectangular frame,
incorporating corner stub posts,
with provision for height adjustment.

9.

An extension module,
as claimed in any of the preceding claims,
comprising a rectangular frame,
incorporating corner stub posts,
configured as telescopic struts.

10.

An extension module,
as claimed in any of the preceding claims,
comprising a rectangular frame,
incorporating corner stub posts,
with demountable end block fittings,
for adjustment of overall post height.

11.

An extension module,
as claimed in any of the preceding claims,
comprising a rectangular frame,
with ventilation holes.

12.

An extension module,
as claimed in any of the preceding claims,
wherein a domed roof canopy extending beyond
the tops of corner stub post fittings.

13.

An extension module,
as claimed in any of the preceding claims,
with a roof canopy incorporating an access hatch.

14.

An extension module,
as claimed in any of the preceding claims,
incorporating a seal for disposition between extension module and any coupled
container

15.

An extension module,
as claimed in any of the preceding claims,
incorporating a seal,
for disposition between extension module
and any coupled container;
the seal including a depending skirt (47).

16.

An extension module,
as claimed in any of the preceding claims,
incorporating a seal,
comprises a resiliently deformable gasket,
eg of rubber or synthetic plastics material.

17.

An extension module,
as claimed in any of the preceding claims,
configured to house auxiliary equipment.

18.

An extension module,
as claimed in any of the preceding claims,
configured to house a vehicle support frame.

19.

An extension module,
as claimed in any of the preceding claims,
configured to house environmental plant.

20.

An extension module,
as claimed in any of the preceding claims,
with housing walls
movable from a horizontal housed position
to a vertical position.

21.

A container,
incorporating an extension module,
as claimed in any of the preceding claims.

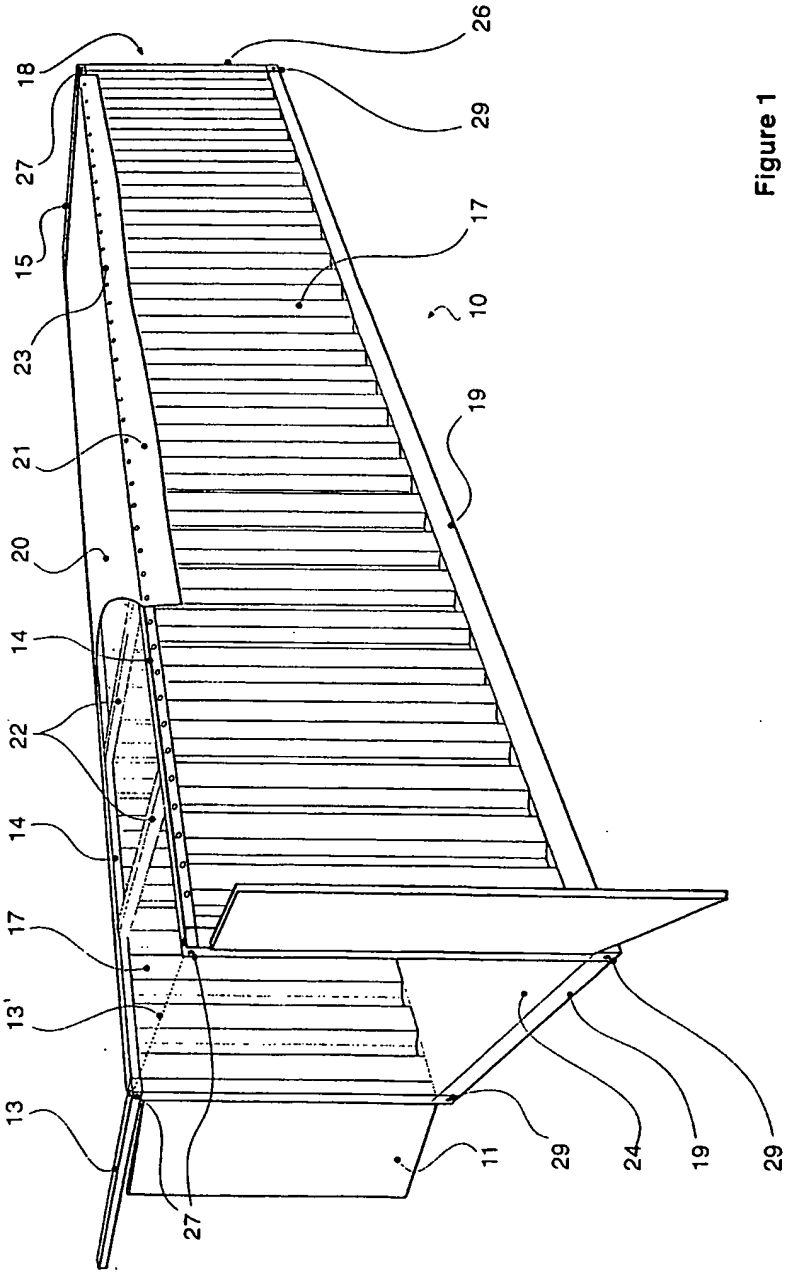

Figure 1

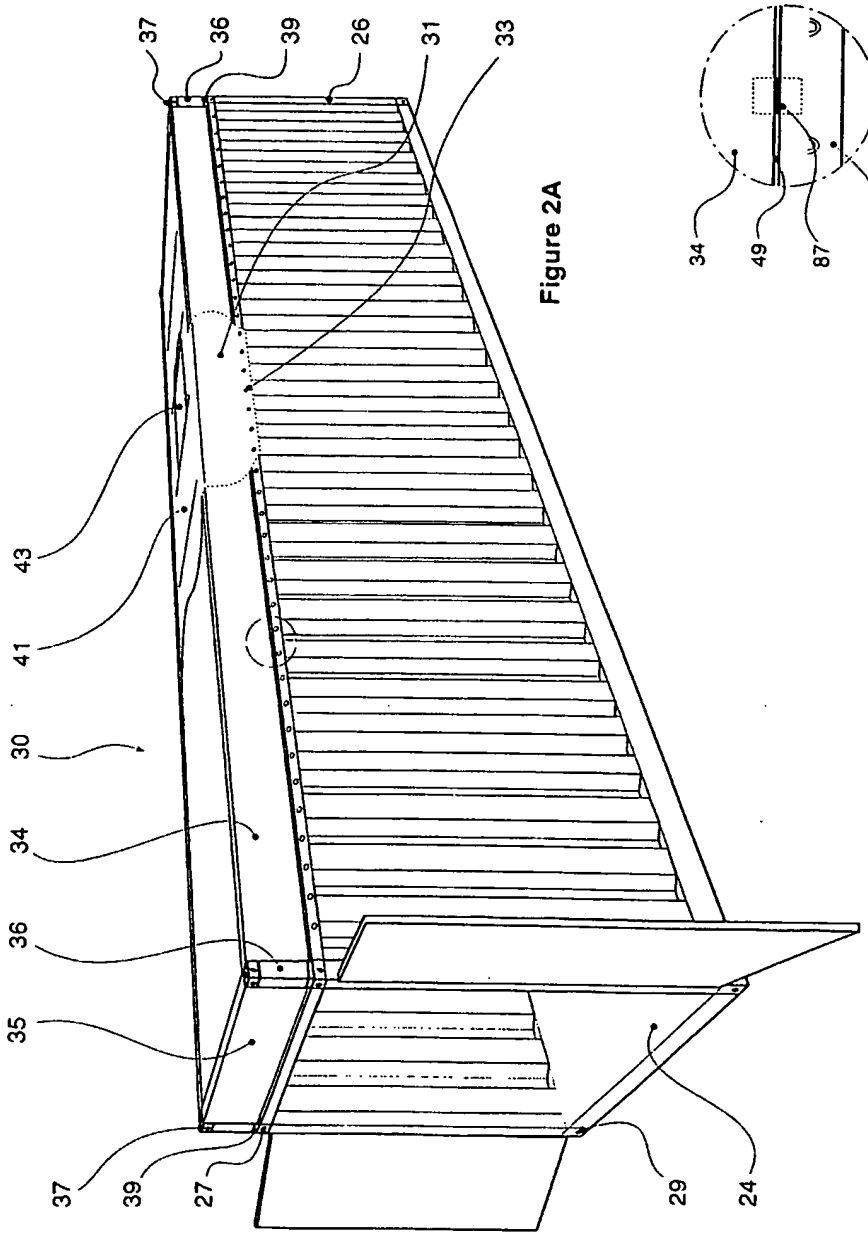

Figure 2A

Figure 2B

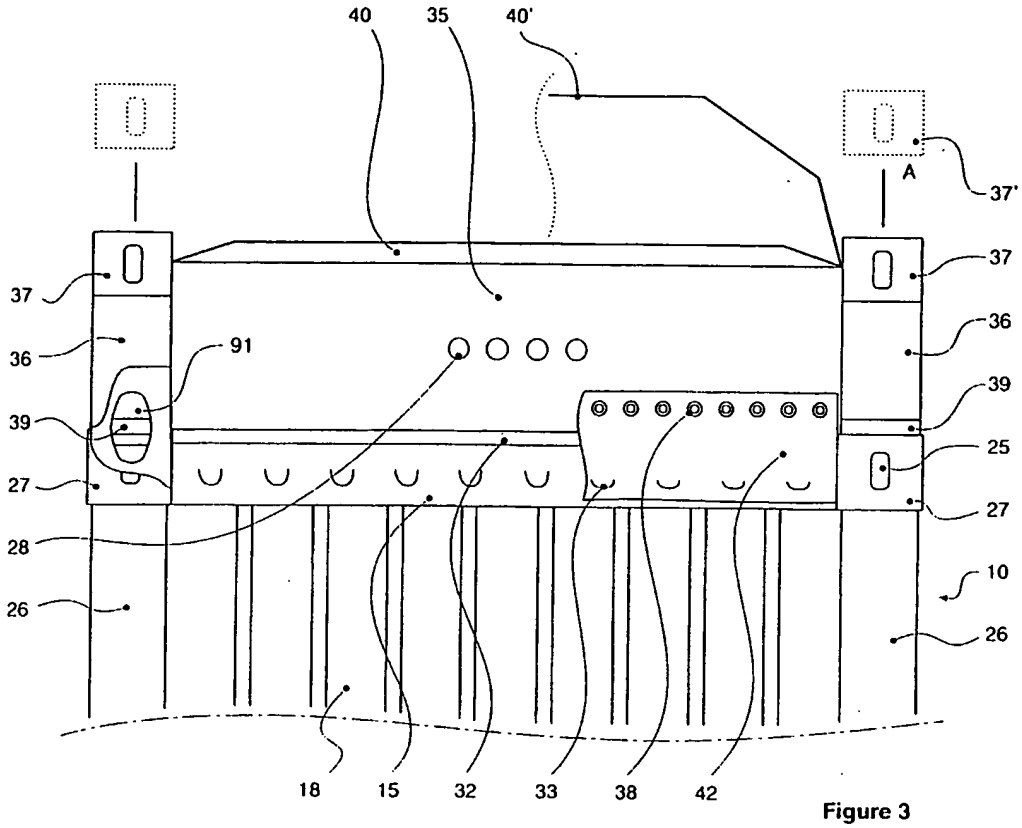

Figure 3

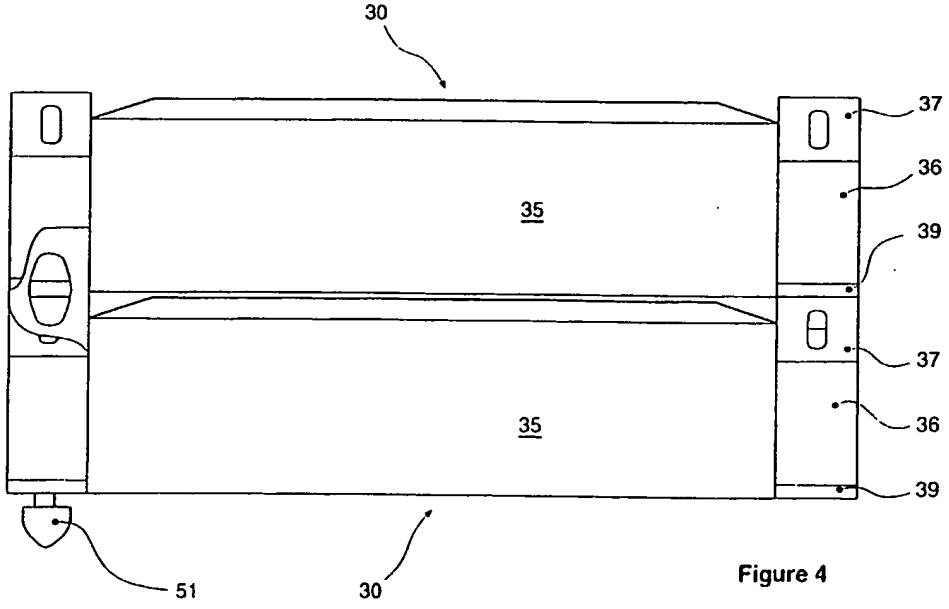

Figure 4

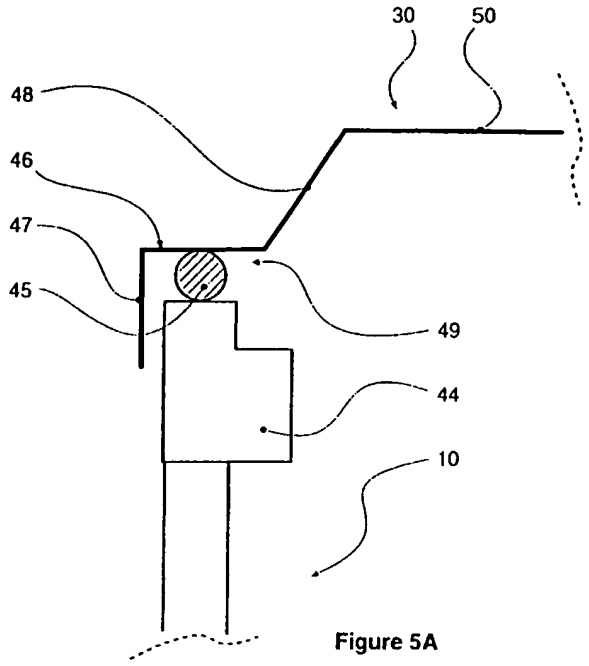

Figure 5A

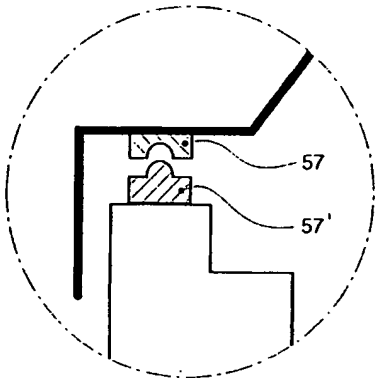

Figure 5C

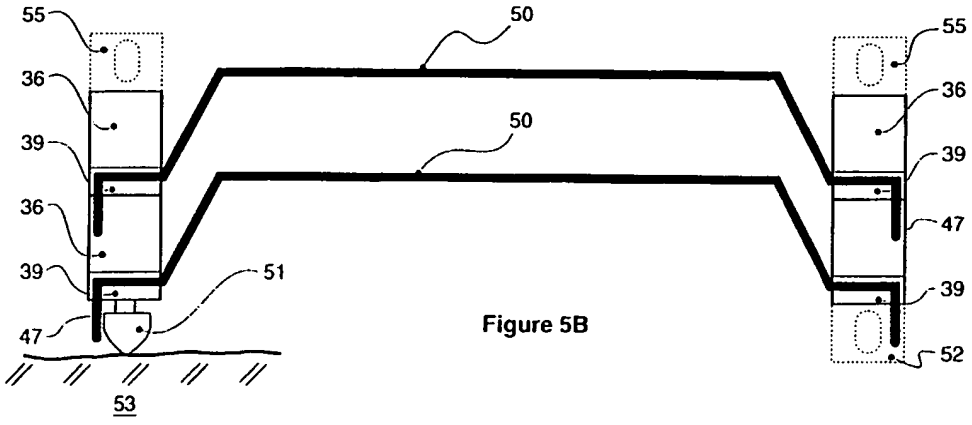

Figure 5B

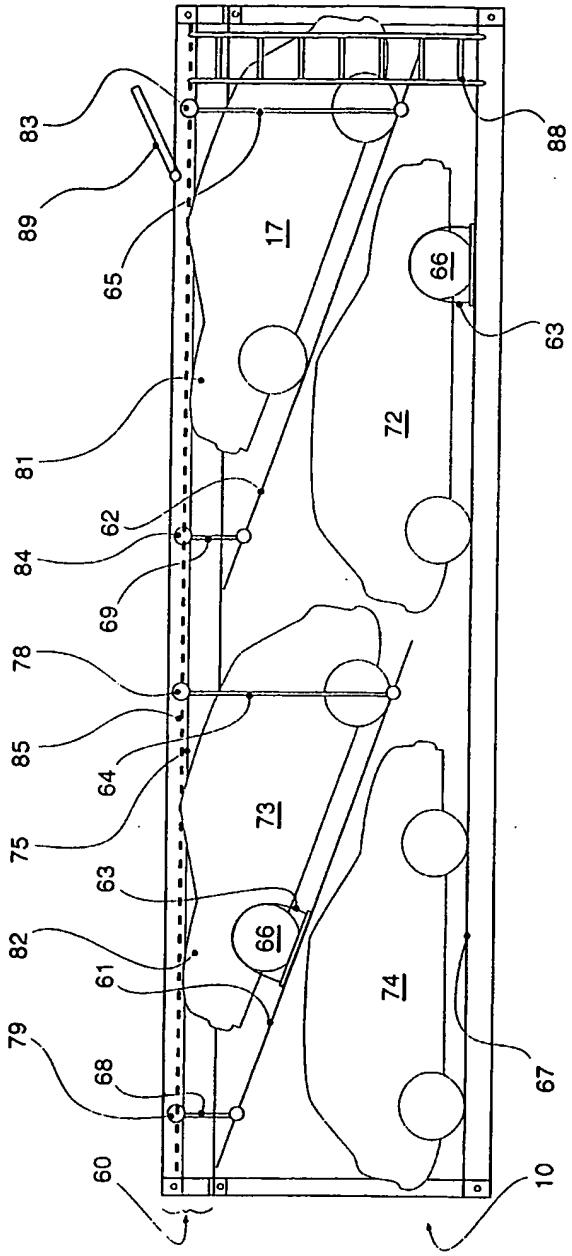

Figure 6

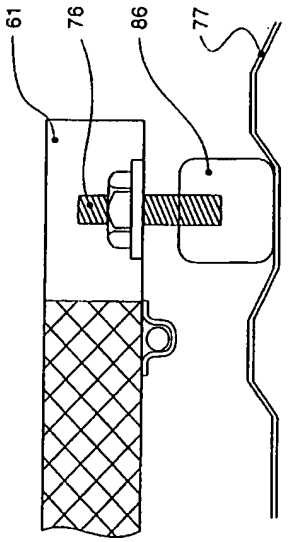

Figure 7

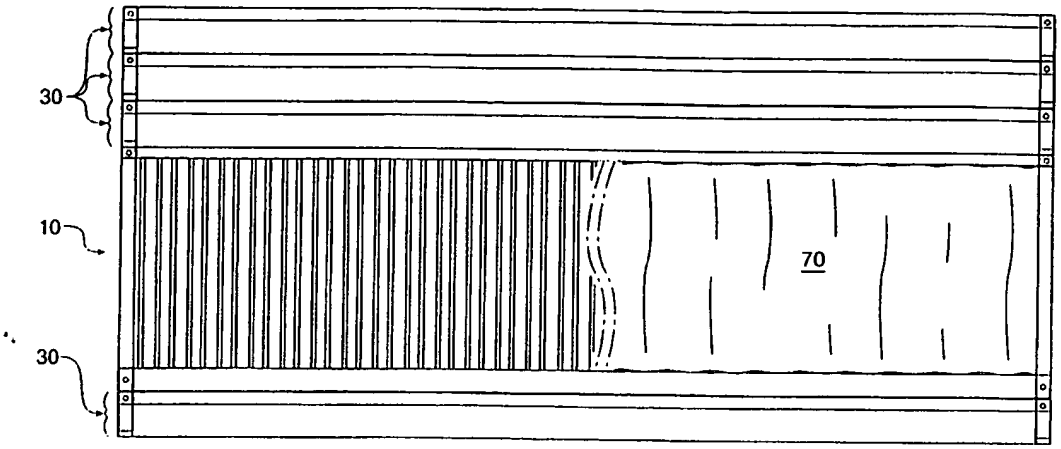

Figure 8A

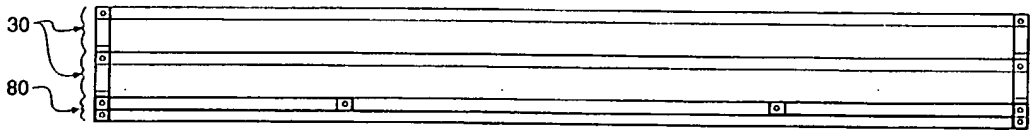

Figure 8B

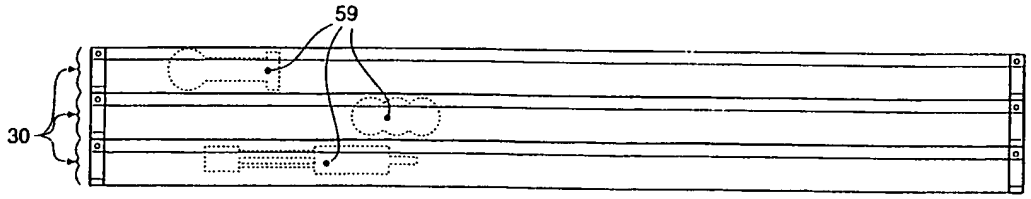

Figure 8C

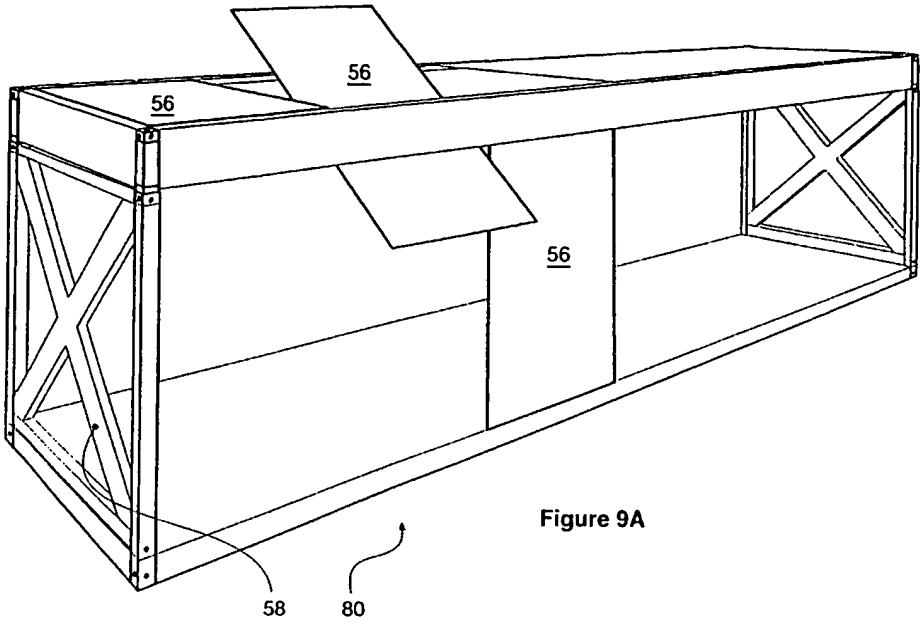

Figure 9A

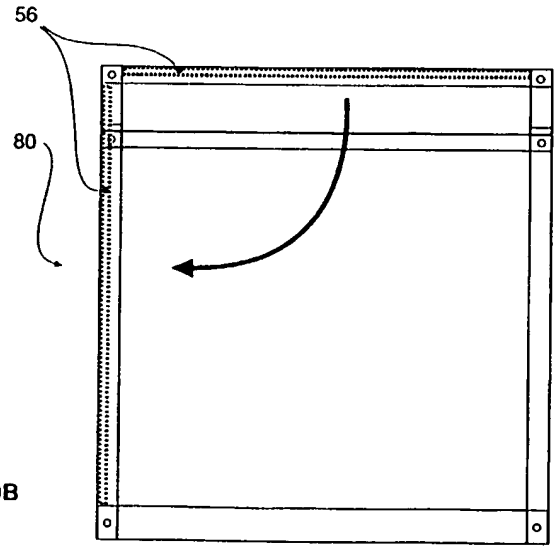

Figure 9B

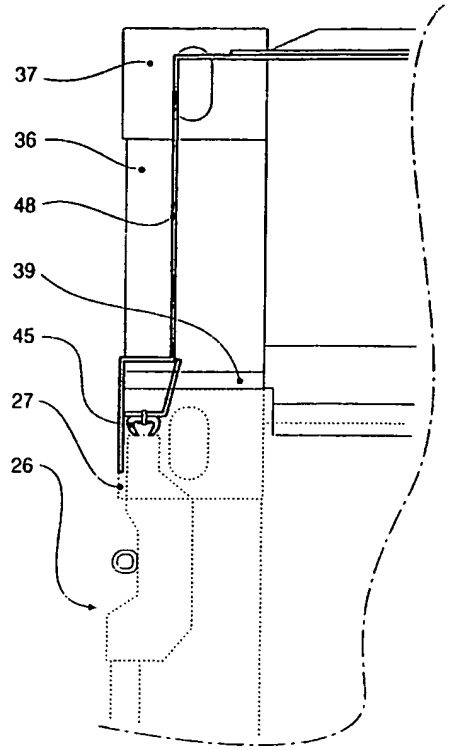

Figure 10A

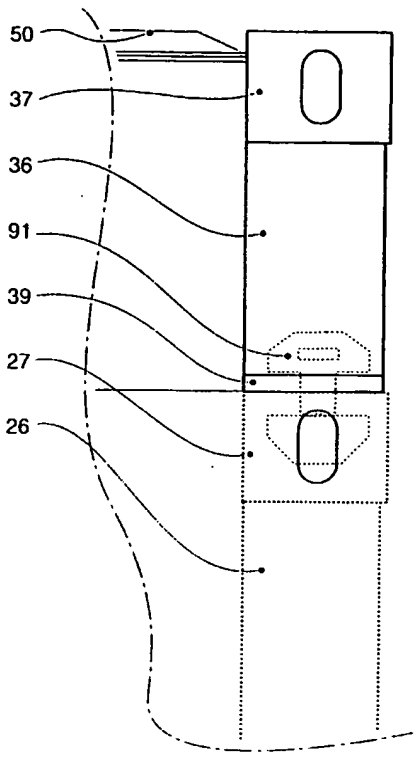

Figure 10B

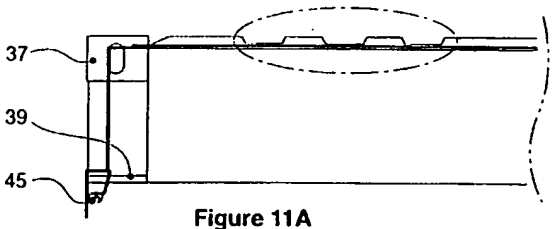

Figure 11A

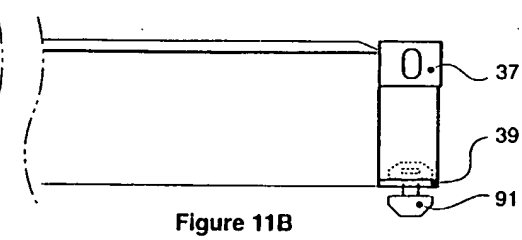

Figure 11B

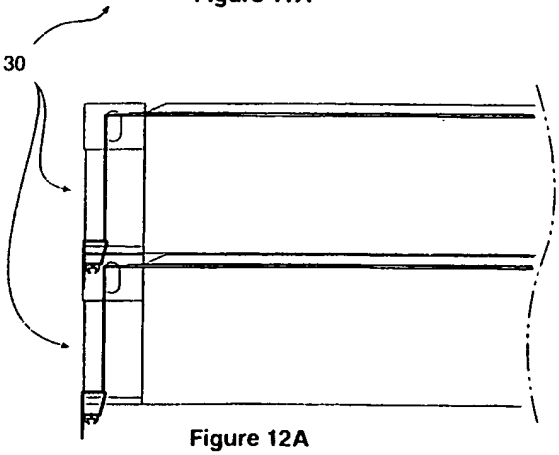

Figure 12A

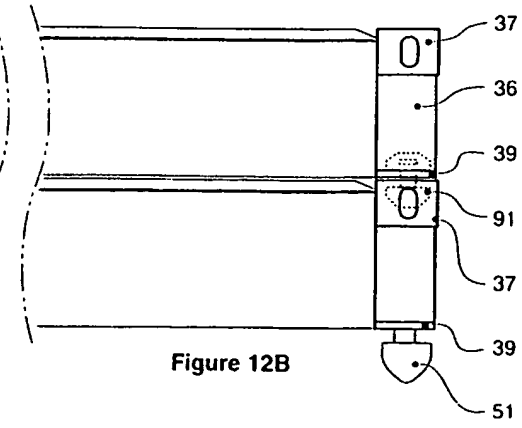

Figure 12B

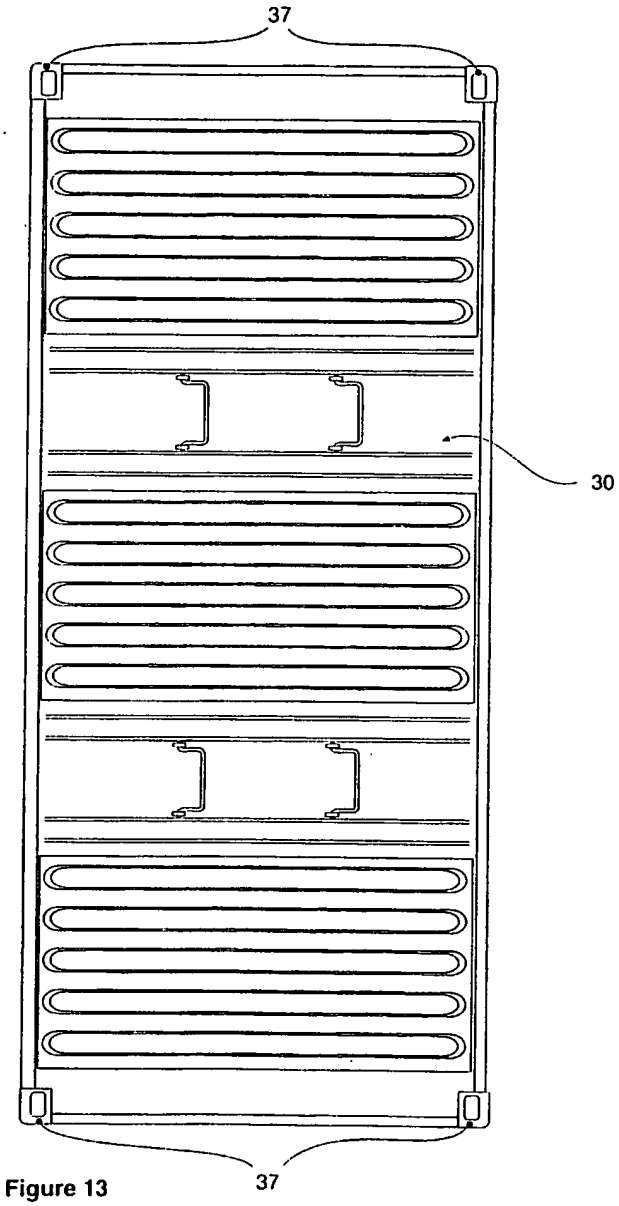

Figure 13

INTERNATIONAL SEARCH REPORT

Inter ial Application No
PCT/GB 01/04403

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D88/52 B65D88/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 801 177 A (EINARSSON J ET AL) 2 April 1974 (1974-04-02) figure 1	1,17-19, 21
X	DE 21 53 684 A (CONTINENTAL GUMMI WERKE AG) 3 May 1973 (1973-05-03) figure 1	1,6,7
A	GB 2 246 337 A (CLIVE SMITH MARTIN) 29 January 1992 (1992-01-29) page 4, paragraph 4; figure 1	1,14-16
A	DE 32 18 240 A (SCHLESWIGER TAUWERKFABRIK) 24 November 1983 (1983-11-24) claim 1; figures 3,4	2-5,12, 13

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 January 2002	05/02/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Zanghi, A

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 345 282 A (KIM JUM GYU) 5 July 2000 (2000-07-05) figure 1	9
A	WO 98 09889 A (CLIVE SMITH MARTIN) 12 March 1998 (1998-03-12) figures	18
A	US 4 360 115 A (SAUNDERS GEORGE D) 23 November 1982 (1982-11-23) figures 1-3	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inten al Application No
PCT/GB 01/04403

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3801177 A	02-04-1974	CA 960158 A1	31-12-1974
DE 2153684 A	03-05-1973	DE 2153684 A1	03-05-1973
GB 2246337 A	29-01-1992	NONE	
DE 3218240 A	24-11-1983	DE 3218240 A1	24-11-1983
GB 2345282 A	05-07-2000	DE 19962172 A1	12-07-2001
		US 6227397 B1	08-05-2001
WO 9809889 A	12-03-1998	AU 739733 B2	18-10-2001
		AU 4123597 A	26-03-1998
		BR 9711995 A	18-01-2000
		CN 1232433 A	20-10-1999
		DE 19782025 T0	03-08-2000
		WO 9809889 A1	12-03-1998
		GB 2332423 A ,B	23-06-1999
US 4360115 A	23-11-1982	US 4209887 A	01-07-1980